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~~PATENT~~
Docket No. 371922004400

CERTIFICATE OF HAND DELIVERY

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Melissa Garton

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SEP 24 2001
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the application of:

W. Thomas NOVAK et al.

Serial No.: 09/731,934

Filing Date: December 8, 2000

For: POSITIONING STAGE WITH STATIONARY AND MOVABLE MAGNET TRACKS

Examiner: Not yet assigned

Group Art Unit: 1756

PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

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Sir:

In response to the Notice to File Corrected Application Papers dated February 22, 2001, and for which a response was due on April 22, 2001, Applicant requests a <u>5-month</u> extension of time to extend the period for response to September 22, 2001 as noted in the attached Petition. With September 22, 2001 being a Saturday, Applicant is making a timely response on Monday, September 24, 2001. Prior to examination on the merits, please amend the application as follows:

AMENDMENTS

In the Specification:

Please delete the paragraph beginning on line 20 of page 5 in its entirety.

Please replace the paragraph beginning on line 17 of page 14 with the following rewritten paragraph:

A representative embodiment of an EUV light lithography system according to the invention is described below. The embodiment is a projection-exposure apparatus employing light in the UV range as the exposure-illumination light. The EUV light will have a wavelength between 0.1 and 400 nm preferably between 1 and 50 nm. Projection-imaging is performed using an imaging-optical system, which forms a "reduced" (demagnified) image of the pattern defined by the mask on the wafer. The optical axis of the imaging-optical system extends in the Z-direction, and the Y-direction is perpendicular to the plane of the page.

Please replace the paragraph beginning on line 26 of page 14 with the following rewritten paragraph:

As noted above, the pattern to be transferred onto the wafer is defined by the reflection-type mask, which is mounted on a mask stage. The wafer is mounted on a wafer stage. Typically, exposure is performed in a step-and-scan manner, wherein the mask pattern is projected in successive portions ("shot regions") while synchronously moving the mask stage and wafer stage relative to each other as exposure progresses. Scanning of the mask and wafer typically is performed in a single dimension relative to the imaging-optical system. Upon exposing all the shot regions on the mask onto respective regions of the wafer surface, exposure of the pattern onto a die of the wafer is complete. Exposure can then progress stepwise to the next die on the wafer.

Please replace the paragraph beginning on line 8 of page 15 with the following rewritten paragraph:

The EUV light used as the illumination light for exposure has low transmittance through the atmosphere. Hence, the optical path through which the EUV light passes desirably is enclosed in a vacuum chamber. The vacuum chamber is evacuated using a suitable vacuum

pump. The EUV light desirably is produced by a laser-plasma X-ray source comprising a xenon target gas. The laser-plasma X-ray source comprises a laser source (serving as an excitation-light source) and a xenon gas supply. The laser-plasma X-ray source is enclosed by a vacuum chamber. The EUV light produced by the laser-plasma X-ray source passes through a window in the vacuum chamber. Window may also be formed as an aperture that permits the laser plasma X-ray source to pass unhindered. It is preferred that the vacuum chamber is separate from the vacuum chamber because debris tends to be generated by a nozzle that discharges the xenon gas.

Please replace the paragraph beginning on line 21 of page 15 with the following rewritten paragraph:

The laser source is configured to generate laser light having a wavelength that can be within the range from infrared to ultraviolet. For example, a YAG laser or excimer laser can be used. The laser light from the laser source is condensed and irradiated onto the stream of xenon gas (supplied from a gas supply) discharged from the nozzle. Irradiation of the stream of xenon gas causes heating of the xenon gas sufficiently to form a plasma. Photons of EUV light are emitted as the laser-excited molecules of xenon gas drop to a lower energy state.

Please replace the paragraph beginning on line 1 of page 16 with the following rewritten paragraph:

A parabolic mirror is situated in the vicinity of xenon-gas discharge. The parabolic mirror collects and condenses the EUV light produced by the plasma. The parabolic mirror constitutes herein the condenser optical system, and the parabolic mirror is situated such that its focal point is nearly at the locus of discharge of the xenon gas from the nozzle. The parabolic mirror comprises a multilayer film suitable for reflecting the EUV light. The multilayer film typically is provided on the concave surface of the parabolic mirror. The EUV light reflected from the multilayer film passes through the window of the vacuum chamber to a condenser mirror. The condenser mirror condenses and reflects the EUV light to the reflection-

type mask. To such end, the condenser mirror also comprises a surficial multilayer film that is reflective to EUV light. EUV light reflected from the condenser mirror illuminates the prescribed shot region on the reflection-type mask. As referred to herein, the parabolic mirror and condenser mirror collectively comprise the "illumination system."

Please replace the paragraph beginning on line 16 of page 16 with the following rewritten paragraph:

The reflection-type mask is configured with a multilayer EUV-reflective surface as described above, as further description of the mask is omitted here. As the EUV light reflects from the mask , the EUV light becomes "patterned" with pattern data from the mask. The patterned EUV light passes through the projection system to the wafer.

Please replace the paragraph beginning on line 21 of page 16 with the following rewritten paragraph:

In one embodiment, the imaging-optical system comprises four reflection mirrors: a concave first mirror, a convex second mirror, a convex third mirror, and a concave fourth mirror. Each of the mirrors comprises a multilayer film (reflective to EUV light) applied to a backing material (article). The mirrors in this embodiment are arranged so that their respective optical axes are coaxial with each other.

Please replace the paragraph beginning on line 27 of page 16 with the following rewritten paragraph:

To prevent obstructing the optical path defined by the respective mirrors, appropriate cutouts are provided in the first mirror, the second mirror, and the fourth mirror. An aperture stop is provided at the position of the third mirror.

Please replace the paragraph beginning on line 4 of page 17 with the following rewritten paragraph:

The EUV light reflected by the reflection-type mask 18 is reflected sequentially by the first mirror through the fourth mirror to form a reduced image of the mask pattern, based on a prescribed demagnification ratio β (for example β - 1/4, 1/5, or 1/6) within the respective shot region on the wafer. The projection system is configured so as to be telecentric on its image side (wafer side).

Please replace the paragraph beginning on line 9 of page 17 with the following rewritten paragraph:

The reflection-type mask is supported, at least in the X-Y plane, by the movable reticle stage. The wafer is supported, desirably in each of the X-, Y-, and Z-directions by the movable wafer stage. During exposure of a die on the wafer, while EUV light is irradiated to each shot region on the mask by the illumination system, the mask and wafer are moved in a coordinated manner relative to the imaging-optical system at a prescribed velocity according to the demagnification ratio of the imaging-optical system. Thus, the mask pattern is scanned progressively and exposed within a prescribed shot range (for a die) on the wafer .

Please replace the paragraph beginning on line 18 of page 17 with the following rewritten paragraph:

During exposure, to prevent gases generated from the resist on the wafer from depositing on and adversely affecting the mirrors of the imaging-optical system, the wafer desirably is situated behind a partition. The partition defines an aperture through which the EUV light can pass from the mirror to the wafer . The space defined by the partition is evacuated by a separate vacuum pump. Thus, gaseous contaminants produced by irradiation of the resist are prevented from depositing on the mirrors or on the mask , thereby preventing deterioration of optical performance of these components.

In the Drawings:

Enclosed herewith are Substitute Drawings in compliance with 37 CFR 1.84.

REMARKS

Prior to examination on the merits, Applicants' respectfully submit this preliminary amendment. The preliminary amendment revises the specification to remove reference to Figure 8, in accordance with option (III) of the Notice to File Corrected Application Papers mailed February 22, 2001. The claims are fully supported by the disclosure as originally filed. Additionally, substitute drawings have been provided in accordance with 37 CFR 1.84 in order to meet the noted margin requirements.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "**Version with markings to show changes made**".

In the unlikely event that the transmittal letter is separated from this document and the Patent Office determines that an extension and/or other relief is required, applicant petitions for any required relief including extensions of time and authorizes the Assistant Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to **Deposit Account No. 03-1952** referencing docket no. 371922004400.

Respectfully submitted,

Dated: September 24, 2001

By:
Kevin R. Spivak
Registration No. 43,148

Morrison & Foerster LLP
2000 Pennsylvania Avenue, N.W.
Washington, D.C. 20006-1888
Telephone: (202) 887-6924
Facsimile: (202) 263-8396